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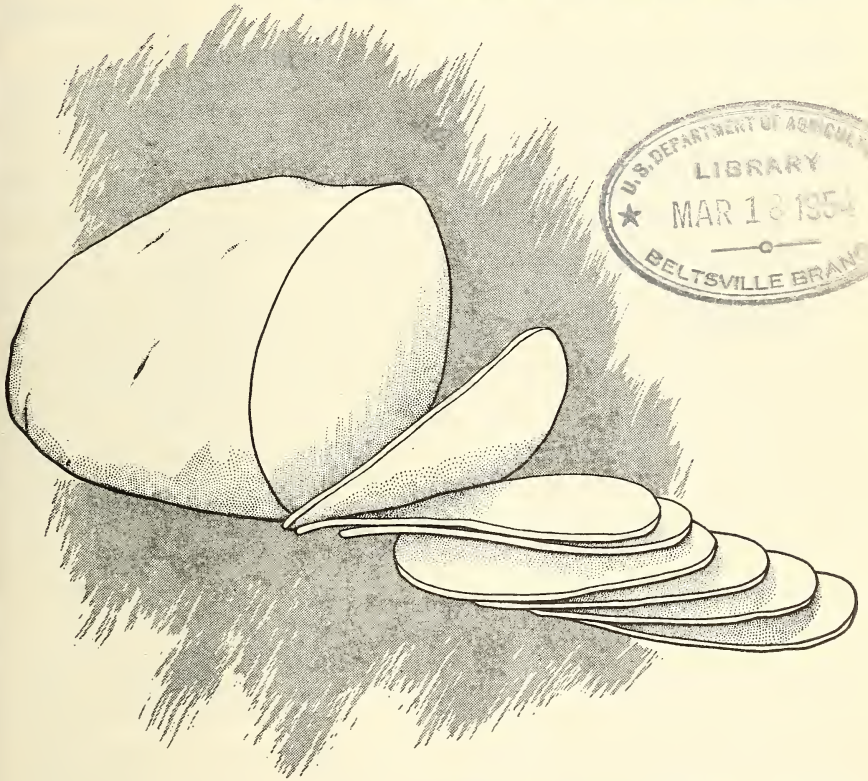
936

Chipping Quality of Eight Potato Varieties

as Affected by Source and by Storage Treatment



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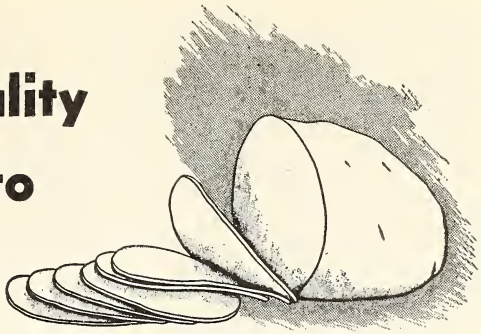

as Affected by Source and by Storage Treatment [1]

By R. C. Wright, *senior physiologist*, and T. M. Whiteman, *associate horticulturist, Biological Science Branch, Agricultural Marketing Service.*

Introduction

Commercial manufacturers of potato chips need to know what varieties and what locations they can depend upon for satisfactory raw stock, and what they can expect from stock that has been stored under different conditions. This circular reports a 3-year study undertaken to determine the comparative suitability for chipping, after different storage treatments, of potatoes of eight commercial varieties grown in several widely separated areas per variety.

So far as chipping quality is concerned, temperatures between 50° and 55° F. are known to be favorable for maintaining potatoes in nearly optimum condition, or about the same as when dug. When potatoes are stored at this range of temperature, their sugar content and their starch content remain nearly unchanged. Sooner or later, however, the potatoes begin to sprout. In 1949 it was demonstrated by the authors [2] that potatoes of most varieties, if stored at 50° directly after harvest, remain dormant for 3 to 4 months—somewhat longer than had commonly been realized. At temperatures of 40° or less, an appreciable increase in sugars occurs. High sugar content of the tubers causes dark brown color in chips. In 1930 Sweetman [3] reported that chips made from potatoes held below 40° were dark brown in color. In 1931 and 1936 Peacock, the authors, and others [4] [5] reported

[1] Report of a study made under the Research and Marketing Act of 1946.

[2] Wright, R. C., and Whiteman, T. M. the comparative length of dormant periods of 35 varieties of potatoes at different storage temperatures. Amer. Potato Jour. 26: 330–335. 1949.

[3] Sweetman, M. D. color of potato chips as influenced by storage temperatures of the tubers and other factors. Jour. Agr. Res. 41: 479–490. 1930.

[4] Peacock, W. M., Wright, R. C., Whiteman, T. M., and Fuller, E. differences in the cooking quality of potatoes due to storage temperatures. Potato Assoc. Amer. Proc. (1930) 17: 109–116. 1931.

[5] Wright, R. C., Peacock, W. M., Whiteman, T. M., and Whiteman, E. F. the cooking quality, palatability, and carbohydrate composition of potatoes as influenced by storage temperature. U. S. Dept. Agr. Tech. Bul. 507, 20 pp., illus. 1936.

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that chips from tubers stored at 40°, 36°, and 32° were unsalable because of their dark brown color, whereas comparable chips from tubers stored at 60° and 70° were rated very acceptable. In 1940 Denny and Thornton [6] reported that the color of potato chips varied according to the reducing sugar content of the potatoes.

In commercial operations, raw stock of a good chipping variety that is too "sweet" as a result of prolonged low-temperature storage is customarily reconditioned, or "desugared," at 70° to 80° F. until it becomes usable. From an economic standpoint one of the most important factors in the suitability of potatoes for chipping is their inherent capacity to recover rapidly from the effects of prolonged low-temperature storage.

The varieties studied are:

Chippewa, a high yielding variety grown in widely separated parts of the United States, chiefly on muck soils. It is used for chipping to a limited extent only.

Green Mountain, grown largely in the northeastern part of the country. Although it yields high-quality table stock, it is usually considered poor for chipping.

Irish Cobbler, an important early maturing variety grown in nearly every State and used extensively for chipping.

Katahdin, a late maturing variety of wide adaptability but of widely varying quality, used extensively for chipping but considered "temperamental," or sensitive to adverse storage conditions.

Russet Burbank, grown commercially in certain far Western States, mostly under irrigation. It has high table quality and is the principal late-crop variety for western chip manufacturers.

Russet Rural, grown largely in Pennsylvania and Michigan. Although usually of poor table quality, it is in demand for chipping in the East.

Sebago, a late-crop variety in the Eastern and Western States and an early-crop variety in the South. It has usually been found satisfactory for chipping.

White Rose, grown mostly in the Pacific Coast States under irrigation. It is the principal early-crop variety for western chippers.

Procedure

In most instances potatoes of a particular variety were obtained from three different States representing as many commercial production areas where that variety is grown as a late crop. In addition to being represented by lots from different States, the Green Mountain and Russet Rural varieties were each represented by lots grown in different parts of the same State and the Russet Burbank by lots grown on dry land and under irrigation within the same State.

In each of the years 1947, 1948, and 1949, U. S. No. 1 grade potatoes of each variety were obtained from each of the selected locations as soon after harvest as practicable and expressed to the Plant Industry Station, at Beltsville, Md. As each lot arrived, a chipping test was made. The lot was then divided into two parts, and these were stored at 55° and 40° F. Later chipping tests were made in winter and spring on sublots stored at 55°. At intervals during the storage season some

[6] Denny, F. E., and Thornton, N. C. Factors for color in the production of potato chips. Boyce Thompson Inst. Contrib. 11: 291–303, illus. 1940.

of the potatoes that had been stored at 40° were transferred to 70° for reconditioning. At four successive weekly intervals during the reconditioning period, samples of these sublots were processed into chips.

For each chipping test 5 or 6 representative tubers were peeled and several slices about ¾₄ inch thick were taken from near the center of each tuber to make a composite sample weighing 200 gm. The sample was washed quickly in cool tapwater, blotted between towels, and fried in peanut oil at 340° F. in an electric fryer holding about 19 pounds of oil. The sample was removed from the fryer when the oil ceased to bubble. At this time the temperature of the oil was 320° to 300°. In a preliminary test, frying under these conditions gave results comparable to those obtained on a large commercial continuous fryer operated at 370° at the start and 340° at the finish. The chips were spread on sheets of white paper to drain and cool. Each sample was weighed to determine the percentage yield and was then rated by the authors on the basis of color.

Chips were rated for color as follows: Very dark brown, 50 or less; dark brown, 55, 60, and 65; medium brown (lowest salable grade), 70; light brown, 75, 80, and 85; cream (less attractive than light brown to most consumers, although not to all), 90. Chips rated below 65 usually had a burned taste.

At the January 1948 sampling of potatoes stored at 55° F., determinations were made of the raw tissue's content of reducing sugars, content of starch, and specific gravity; of chip yield; and of oil content of chips. Sugar content of the raw tissue was determined by the Bertrand modification of the Munson and Walker method (and was expressed as dextrose on the fresh-weight basis); starch content, by Nielsen's method; [7] and oil content, by extracting the oil with toluene from weighed samples of chips and then reweighing the samples. The difference between weight before and weight after extraction was recorded as weight of oil; no corrections were made for the small amounts of moisture in the chips at the start. Likewise in January 1948, sugar-content determinations on potatoes used in reconditioning tests were made at the time of the change from 40° to 70° temperature, and such determinations were repeated at weekly intervals during a month of the reconditioning treatment.

Results With Potatoes Stored Continuously at 55° F.

Some sprouting was usually apparent by February in potatoes stored at 55° F. Growth was slow, however, and by the middle of March the sprouts were usually not more than an inch long. Sprouting of this degree is ordinarily not objectionable to chip manufacturers.

The color ratings of the chips made from samples of all sublots stored continuously at 55° F. are given in table 1. The chips from a great majority of these sublots were rated 70 or above. With a few exceptions, the chipping quality of each lot was fairly stable throughout the storage period. The Maine potatoes of the Green Mountain variety, which is generally considered unsuitable for chipping, made acceptable chips in winter and spring of each of the two seasons they were studied, but Green Mountain potatoes from Long Island did not prove satisfactory for chipping. The Irish Cobbler and Sebago varieties appeared

[7] Nielsen, J. P., and Gleason, P. C. rapid determination of starch. Indus. and Engin. Chem., Analyt. Ed., 17: 131–134, illus. 1945.

TABLE 1.—*Chipping quality of potatoes of 8 varieties from different areas at intervals during storage at 55° F.*

Variety and source	Color rating of chips [1]												
	1947–48			1948–49				1949–50				Source average	Overall average
	When received	Jan. 16	Apr. 13	When received	Dec. 8	Jan. 25	Feb. 21	When received	Dec. 15	Feb. 9	Mar. 7		
Chippewa:													
Maine	50	80	90	90	85	85	95	80	------	85	75	81. 5	78. 3
Michigan	75	80	80	80	80	------	65	80	------	70	80	76. 7	
Indiana	------	------	------	80	75	75	65	85	------	70	80	75. 7	
Green Mountain:													
Maine:													
Area 1	50	70	80	------	------	------	------	------	------	70	70	68. 0	63. 3
Area 2	50	70	70	------	------	------	------	------	------	70	70	66. 0	
Long Island	50	65	50	------	------	------	------	------	------	55	60	56. 0	
Irish Cobbler:													
Maine	70	80	70	90	90	90	95	80	85	95	90	85. 0	82. 7
Wisconsin	80	90	80	90	90	90	95	80	80	80	85	85. 4	
North Dakota	------	------	------	80	80	75	70	70	70	80	80	75. 6	
Katahdin:													
Maine	75	80	50	85	75	70	70	80	70	70	80	73. 2	75. 2
Pennsylvania	70	50	70	85	80	75	70	85	80	85	85	75. 9	
Colorado	85	80	80	70	80	60	70	------	70	80	90	76. 5	
Russet Burbank:													
Idaho:													
Dry land	------	------	------	70	60	65	75	60	60	------	70	65. 7	78. 1
Irrigated land	70	90	90	70	65	65	70	80	70	------	85	75. 5	
Washington	85	90	80	90	85	80	90	80	90	------	90	86. 0	
California	80	90	90	80	------	85	------	------	------	------	------	85. 0	

Russet Rural:													
Pennsylvania:													
Centre County	80	90	90		75	75	75					80. 8	
Lehigh County					85	85	85					85. 0	
Lancaster County					85	75	90					83. 3	81. 4
Potter County					75	75	75					75. 0	
Michigan	80	80	90		75	85	85					82. 5	
Sebago:													
Maine	80	90	90	75	80	80	80					82. 1	
Wisconsin	80	90	70	90	85	85	85					83. 6	84. 0
Washington	80	90	80	90	85	85	95					86. 4	
White Rose:													
Idaho	70	80	50									66. 7	
Washington	80	80	30									63. 3	64. 4
California	70	70	50									63. 3	

[1] Scale of color ratings: Very dark brown, 50 or less; dark brown, 55, 60, and 65; medium brown (lowest salable grade), 70; light brown, 75, 80, 85; cream (less attractive than light brown to most consumers, although not to all), 90.

to be the most consistent in maintaining approximately uniform chipping quality. Chips from the lots of White Rose tubers tested were rated 70 or 80 in January but only 30 or 50 in April. Since this variety was studied in one season only, results obtained with it are less conclusive than those obtained with the other varieties. On the basis of average chip ratings the varieties ranked in descending order of desirability as follows: Sebago, Irish Cobbler, Russet Rural, Chippewa and Russet Burbank, Katahdin, White Rose, Green Mountain.

The results of the determinations of reducing sugars, starch, and specific gravity of the raw tissue and of chip yield and oil content of chips made at the January 1948 sampling of potatoes stored at 55° F. are given, with the chip ratings, in table 2. The data on chip yields are useful as indicating inherent differences in potato tissue according to variety and lot. Being based on weight of peeled potatoes, they should not be compared directly with data on chip yields in commercial operations, which are based on weight of unpeeled, unwashed potatoes. Considerable differences appear between lots of the same variety, as well as between varieties. In descending order of average yield of chips the varieties ranked as follows: Russet Burbank, Green Mountain, White Rose, Sebago, Katahdin, Russet Rural and Irish Cobbler, Chippewa.

Oil content of chips was in general lower for the varieties giving the greater yields of chips (table 2). It was highest for the Chippewa potatoes. Following Chippewa in descending order of oil content were Katahdin and Sebago, Irish Cobbler, Russet Rural and Green Mountain, White Rose, and Russet Burbank. A difference of a few percentage points in oil content of chips is economically important because of the cost of the oil.

The highest yields of chips were obtained from potatoes with high specific gravity and high starch content. In general, oil content was higher in chips from potatoes of relatively low specific gravity. Varieties differed widely in specific gravity [8] and starch content.

As was to be expected, no excessive amounts of reducing sugar were found in potatoes held at 55° F. For lots for which average content of reducing sugar was not more than about 0.2 percent, chip ratings were 80 or higher. Lower chip ratings were usually associated with reducing sugar content of about 0.3 percent or more.

Reconditioning Responses of Potatoes Moved From 40° to 70° F.

Whereas the chips from a great majority of the sublots of potatoes stored at 55° F. were rated 70 or above, those from all sublots taken directly from 40° storage were much too brown to be salable. The color ratings given at each of 4 weekly sampling dates to chips made from potatoes that had been moved from 40° to 70° for desugaring are shown in table 3. During the 3 seasons of the tests considerable variation in reconditioning response was apparent. In some instances reconditioning proceeded less rapidly in the December or January period than in the March or April period. In many instances the March or April reconditioning tests were as successful as tests made

[8] For further discussion of variations in specific gravity of most of the lots of potatoes used in the tests reported here, see HEINZE, P. H., and CRAFT, C. C. VARIATIONS IN SPECIFIC GRAVITY OF POTATOES. Amer. Potato Jour. 29: [31]–37. 1952.

TABLE 2.—*Color ratings, yields, and oil content of chips made on Jan. 16, 1948, from potatoes that had been stored at 55° F. until that time, and reducing sugar content, starch content, and specific gravity of the raw potato tissue*

Variety and source	Color rating [1]	Chip yield [2] per 100 grams of potato	Oil content	Reducing sugar [3]	Starch [4]	Specific gravity [5]
		Gm.	*Percent*	*Percent*	*Percent*	
Chippewa:						
Maine	80	29. 6	40. 3	0. 15	12. 9	1. 06
Michigan	80	27. 6	36. 6	. 13	12. 9	1. 07
Average	80	28. 6	38. 4	. 14	12. 9	1. 05
Green Mountain:						
Maine:						
Area 1	70				17. 3	1. 09
Area 2	70	32. 2	38. 0	. 49	15. 0	1. 08
Long Island	65	36. 6	31. 5	. 24	21. 2	1. 10
Average	68	34. 4	34. 7	. 36	17. 8	1. 09
Irish Cobbler:						
Maine	80	29. 3	35. 4	. 20	15. 0	1. 08
Wisconsin	90	33. 2	35. 7	. 18	15. 8	1. 08
Average	85	31. 2	35. 5	. 19	15. 4	1. 08
Katahdin:						
Maine	80	32. 6	38. 0	. 23	14. 0	1. 08
Pennsylvania	50	29. 8	37. 7	. 38	12. 5	1. 06
Colorado	80	33. 0	36. 5	. 16	15. 8	1. 08
Average	70	31. 8	37. 4	. 26	14. 1	1. 07
Russet Burbank:						
Idaho	90	33. 9	33. 1	. 31	17. 5	1. 10
Washington	90	35. 9	29. 5	. 12	19. 5	1. 10
California	90	36. 9	31. 9	. 17	18. 2	1. 10
Average	90	35. 6	31. 5	. 20	18. 4	1. 10
Russet Rural:						
Pennsylvania	90	32. 0	34. 1	. 25	15. 0	1. 08
Michigan	80	30. 5	35. 5	. 12	13. 9	1. 08
Average	85	31. 2	34. 8	. 18	14. 4	1. 08
Sebago:						
Maine	90	30. 6	37. 0	. 17	14. 5	1. 08
Wisconsin	90	32. 5	39. 8	. 15	13. 5	1. 07
Washington	90	35. 5	34. 9	. 14	16. 3	1. 09
Average	90	32. 9	37. 2	. 15	14. 8	1. 08
White Rose:						
Idaho	80	33. 8	34. 0	. 26	16. 9	1. 10
Washington	80	36. 7	30. 9	. 20	16. 3	
California	70	30. 6	37. 2	. 33	15. 6	1. 08
Average	77	33. 7	34. 0	. 26	16. 3	1. 09

[1] For significance of ratings, see footnote of table 1.
[2] Calculated on the basis of weight of peeled potatoes and therefore not comparable with commercial yield figures, which are based on weight of unpeeled, unwashed potatoes.
[3] Calculated on fresh-weight basis.
[4] Determinations by P. M. Lombard.
[5] Determinations by P. H. Heinze.

TABLE 3.—*Reconditioning responses of potatoes first stored at 40° F. and then moved to 70° as measured by the color ratings* [1] *of chips made after 1, 2, 3, and 4 weeks' reconditioning at 70°*

Variety and source	1947–48								1948–49							
	First test, starting Jan. 29				Second test, starting Mar. 16				First test, starting Dec. 7				Second test, starting Mar. 24			
	1 wk.	2 wks.	3 wks.	4 wks.	1 wk.	2 wks.	3 wks.	4 wks.	1 wk.	2 wks.	3 wks.	4 wks.	1 wk.	2 wks.	3 wks.	4 wks.
Chippewa:																
Maine	80	80	70	80	50	80	80	80	80	85	85	85	85	90	90	90
Michigan	50	50	70	90	50	50	70	70	--	--	--	--	65	75	65	60
Indiana	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Green Mountain:																
Maine:																
Area 1	80	90	90	90	70	70	80	80	--	--	--	--	--	--	--	--
Area 2	50	50	50	60	50	40	40	50	--	--	--	--	--	--	--	--
Long Island	50	40	40	50	50	40	40	40	--	--	--	--	--	--	--	--
Irish Cobbler:																
Maine	50	50	80	80	50	50	70	90	70	80	85	95	90	85	95	95
Wisconsin	50	50	50	70	50	50	50	50	70	65	60	65	65	65	75	70
North Dakota	--	--	--	--	--	--	--	--	65	55	50	50	60	60	50	65
Katahdin:																
Maine	80	90	90	90	70	70	80	80	65	60	70	80	80	75	80	85
Pennsylvania	30	50	50	70	50	50	50	50	50	55	60	80	50	60	70	80
Colorado	50	80	70	70	50	70	80	80	60	55	70	75	65	65	65	70
Russet Burbank:																
Idaho:																
Dry land	--	--	--	--	--	--	--	--	50	50	70	80	80	75	75	85
Irrigated land	80	80	90	90	50	70	80	80	50	55	65	60	65	60	65	60
Washington	80	80	80	90	50	50	50	70	60	55	60	75	70	70	70	80
California	90	90	90	90	50	80	90	90	--	--	--	--	--	--	--	--
Russet Rural:																
Pennsylvania:																
Centre County	80	80	90	80	70	50	80	80	--	--	--	--	50	60	70	80
Lehigh County	--	--	--	--	--	--	--	--	65	70	70	65	65	75	75	80
Lancaster County	--	--	--	--	--	--	--	--	60	70	80	90	40	40	65	65
Potter County	--	--	--	--	--	--	--	--	50	70	65	80	65	75	70	75
Michigan	50	50	90	80	50	50	50	50	--	--	--	--	65	80	85	90
Sebago:																
Maine	90	90	90	90	90	90	90	90	60	70	80	90	60	70	75	90
Wisconsin	50	40	50	70	50	50	50	50	55	50	50	70	55	70	65	60
Washington	80	80	70	80	50	70	70	70	50	55	50	70	55	60	70	60
White Rose:																
Idaho	70	70	50	50	50	70	50	40	--	--	--	--	--	--	--	--
Washington	50	50	50	70	40	40	40	40	--	--	--	--	--	--	--	--
California	50	50	50	50	50	50	40	40	--	--	--	--	--	--	--	--

[1] For significance of color ratings, see footnote of table 1.

TABLE 3.—*Reconditioning responses of potatoes first stored at 40° F. and then moved to 70° as measured by the color ratings* [1] *of chips made after 1, 2, 3, and 4 weeks' reconditioning at 70°*—Continued

Variety and source	1949–50											
	First test, starting Jan. 9			Second test, starting Mar. 16				Third test, starting Apr. 25			
	1 wk.	2 wks.	3 wks.	1 wk.	2 wks.	3 wks.	4 wks.	1 wk.	2 wks.	3 wks.	4 wks.
Chippewa:											
Maine	65	75	55	80	70	70	80	75	80	75	75
Michigan	60	50	65	60	70	65	75	55	70	75	60
Indiana	60	70	75	70	70	80	70	65	70	80	80
Green Mountain:											
Maine:											
Area 1	---	---	---	80	75	80	70	70	80	70	80
Area 2	---	---	---	70	60	65	65	70	60	70	70
Long Island	---	---	---	40	50	50	40	40	40	40	40
Irish Cobbler:											
Maine	75	80	75	85	80	70	80	75	90	85	80
Wisconsin	50	60	60	70	60	70	70	65	70	70	70
North Dakota	70	65	70	80	75	70	75	70	80	80	70
Katahdin:											
Maine	50	60	70	60	60	50	50	60	60	60	70
Pennsylvania	60	65	70	60	50	70	70	60	70	75	80
Colorado	60	70	75	70	70	65	75	80	95	80	80
Russet Burbank:											
Idaho:											
Dry land	60	65	75	85	75	80	75	80	70	80	80
Irrigated land	75	70	80	80	85	85	80	80	90	80	85
Washington	75	75	75	---	---	---	---	80	95	80	80

[1] For significance of color ratings, see footnote of table 1.

earlier in the storage season. Among instances in which reconditioning was successful in winter but not in spring were the 1948 tests with Pennsylvania Katahdin, Michigan Russet Rural, and Wisconsin Sebago stock. In some instances there were marked differences in response between lots of the same variety grown on different areas or in different years.

The results of sugar-content determinations made at four weekly intervals within the January 1948 reconditioning period are shown in table 4. When these sugar-content data are compared with the chip color ratings for the same period (table 3) it is seen that improvement in chip quality accompanied decreases in the proportion of sugar, particularly reducing sugar, in the raw tissue. In some lots the sugar content diminished at 70° F. very slowly.

Summary and Conclusion

Potatoes of 8 varieties from 3 or more production areas per variety were subjected to storage and chipping tests during 3 seasons.

The chipping quality (as measured by chip color rating) of potatoes stored continuously at 55° F. remained fairly stable during the winter

TABLE 4.—*Sugar content*[1] *of potatoes used in January 1948 reconditioning tests, at the time of removal from storage at 40° F. and after subsequent 1-, 2-, 3-, and 4-week periods of reconditioning at 70°*

Variety and source	Direct from 40° storage			After 1 week at 70°		
	Reducing sugar	Sucrose	Total	Reducing sugar	Sucrose	Total
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Chippewa:						
Maine	1.35	0.43	1.78	0.19	0.18	0.37
Michigan	1.28	.46	1.74	.42	.09	.51
Green Mountain:						
Maine:						
Area 1	.93	.34	1.27	.28	.15	.43
Area 2	1.33	.32	1.65	.69	.16	.85
Long Island	.90	1.11	2.01	.71	.50	1.21
Irish Cobbler:						
Maine	.78	.27	1.05	.25	.12	.35
Wisconsin	1.15	.31	1.46	.74	.13	.87
North Dakota	.88	1.09	1.97	.74	.78	1.52
Katahdin:						
Maine	1.24	.38	1.62	.20	.11	.31
Pennsylvania	1.15	.33	1.48	.71	.11	.82
Colorado	.89	.42	1.31	.44	.22	.66
Russet Burbank:						
Idaho[2]	.96	.26	1.22	.36	.17	.53
Washington	.88	.49	1.37	.32	.18	.50
California	.56	.34	.90	.20	.14	.34
Russet Rural:						
Pennsylvania	.85	.28	1.13	.12	.09	.21
Michigan	.91	.35	1.26	.33	.23	.56
Sebago:						
Maine	.94	.31	1.25	.12	.07	.19
Wisconsin	1.19	.72	1.91	.69	.34	1.03
Washington	1.11	.61	1.72	.46	.29	.75
White Rose:						
Idaho	1.13	.33	1.46	.79	.27	1.06
Washington	1.29	.39	1.68	.65	.21	.86
California	1.20	.31	1.51	.68	.18	.86

[1] All sugars are expressed as dextrose.
[2] Irrigated land.

and into March or April. Some sprouting was usually apparent in these potatoes by February, but by the middle of March the sprouts usually were not more than an inch long. Sprouting of this degree is ordinarily not objectionable to chip manufacturers.

Potatoes of all the varieties studied made undesirably dark-colored chips when taken directly from storage at 40° F. At fixed intervals sublots of potatoes were moved from 40° to 70° for reconditioning. After the transfer these sublots were subjected to chipping tests at weekly intervals. Most of them made satisfactory chips after 4 weeks or less of reconditioning at 70°. Usually the reconditioning treatment gave as good results in the spring as in early winter.

There were considerable differences in response to storage and reconditioning treatments between lots of different varieties and also between lots of certain individual varieties grown on different areas or in different seasons.

TABLE 4.—*Sugar content* [1] *of potatoes used in January 1948 reconditioning tests, at the time of removal from storage at 40° F. and after subsequent 1-, 2-, 3-, and 4-week periods of reconditioning at 70°*—Con.

Variety and source	After 2 weeks at 70°			After 3 weeks at 70°,	After 4 weeks at 70°		
	Reducing sugar	Sucrose	Total	reducing sugar	Reducing sugar	Sucrose	Total
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Chippewa:							
Maine	0. 27	0. 11	0. 38	Tr	Tr	Tr	Tr
Michigan	. 22	. 29	. 51	0. 29	Tr	Tr	0. 18
Green Mountain:							
Maine:							
Area 1	. 12	. 22	. 34	. 12	Tr	Tr	. 23
Area 2	. 54	. 07	. 61	. 38	0. 23	0. 15	. 38
Long Island	. 59	. 54	1. 13	. 34	. 28	. 54	. 82
Irish Cobbler:							
Maine	. 18	. 18	. 36	. 21	Tr	Tr	Tr
Wisconsin	. 56	. 31	. 87	. 59	. 31	. 12	. 43
North Dakota	. 36	. 80	1. 16	. 50	Tr	-------	-------
Katahdin:							
Maine	Tr	Tr	Tr	Tr	Tr	Tr	Tr
Pennsylvania	. 49	. 13	. 62	. 23	. 25	. 17	. 42
Colorado	. 26	. 18	. 44	. 16	Tr	-------	. 15
Russet Burbank:							
Idaho [2]	. 18	. 13	. 31	. 10	Tr	Tr	. 20
Washington	. 24	. 21	. 45	. 23	Tr	Tr	. 23
California	Tr	-------	Tr	Tr	Tr	Tr	Tr
Russet Rural:							
Pennsylvania	. 13	. 35	. 48	Tr	Tr	Tr	. 18
Michigan	. 17	. 29	. 46	Tr	Tr	Tr	. 18
Sebago:							
Maine	. 22	. 13	. 35	Tr	-------	-------	-------
Wisconsin	. 70	. 28	. 98	. 46	. 27	. 23	. 50
Washington	. 34	. 22	. 56	. 20	Tr	Tr	. 14
White Rose:							
Idaho	. 50	. 20	. 70	. 35	. 28	. 14	. 42
Washington	. 33	. 21	. 54	. 38	. 15	. 15	. 30
California	. 55	. 16	. 72	. 49	. 32	. 14	. 46

[1] All sugars are expressed as dextrose. Tr=trace.
[2] Irrigated land.

In general, chips from tubers with the highest reducing sugar content were the darkest colored.

The tubers' yield of chips tended to vary directly with the specific gravity and starch content of the raw tissue and inversely with the oil content of the chips.

In these tests the Russet Burbank variety took first rank, because of rapid reconditioning, high chip yield, low oil content of chips, and attractive appearance of chips. Russet Rural ranked second. On an average it reconditioned somewhat faster than either Irish Cobbler or Katahdin. Irish Cobbler and Katahdin were about equal in rank. They required about the same time to recondition. Chip yield was the same for Irish Cobbler as for Russet Rural, and was slightly higher for Katahdin. Oil content of chips was slightly higher for Katahdin than for the two other varieties just named. Some commericial chippers believe that Irish Cobbler and Katahdin recondition

much less well in late winter than Russet Rural, but in this study these two varieties reconditioned about as well as Russet Rural or even better in tests starting on January 29 and March 16, 1948, and March 24, 1949. (It is believed that Irish Cobbler and Katahdin are more sensitive to chilling than Russet Rural, and that their good showing in comparison with it in this study may be explained by the fact that no temperature lower than 40° F. was used.)

Sebago yielded about as attractive chips as any other variety, and its chip yield was higher than that of either Irish Cobbler or Russet Rural; but the tubers usually did not recondition so rapidly as those of Russet Rural, and the oil content of the chips was higher than for either Irish Cobbler or Russet Rural. Chippewa usually yielded attractivec hips, but oil content of chips was higher and chip yield was lower for this variety than for any other studied. Although Green Mountain potatoes grown in Maine yielded chips of good quality in the reconditioning tests, the performance of those from another Maine area and from an area on Long Island supports the common belief that the Green Mountain variety is undesirable for chipping. White Rose, in these tests, ranked last in desirability.

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